3GPP TSG-RAN WG4 Meeting # 104-e [draft] R4-221xxxx

Electronic Meeting, 15th – 26th August, 2022

**Title: [Draft] Way forward on NB-IoT/eMTC NTN agenda item 12.5.1 & 12.5.4**

**Agenda Item: 12.5.6**

**Source: MediaTek Inc.**

**Document for: Discussion in GTW**

# Introduction

This document highlights aspects that the moderator believes can be approved, and other aspects for further discussion.

Items in highlighted in yellow would benefit from GTW time, as well as general approval of the UE RF requirements that are not marked in red.

1. Discussion

## 2.1 Topic#1: Work Plan and Scope

**Sub-topic #1-1**

**Issue 1-1-1: Work Plan**

Moderator Proposal: Work plan to be endorsed from RF side, but the rapporteur understands there are a few minor comments from the RRM session, so will need a revision.

**Issue 1-1-2: Way of working**

Moderator Proposal:Not to further discuss the separation of work between NB1/2 and cat-M1 at this stage, unless a specific problem is identified with WI progress.

**Sub-topic #1-2**

**Issue 1-2-1: Deployment scenario (standalone vs other operating modes)**

Moderator Proposal: Agree to focus the WI requirements work on the standalone deployment scenario for NB-IoT and cat-M1 operation.

Discussion:

ZTE: We are fine with moderator proposals. I think for eMTC part different companies had different understanding. For UE only 1.4MHz is supported while for BS all the bandwidths can be supported.

Agreement:

* Agree to focus the WI requirements work on the standalone deployment scenario for NB-IoT and cat-M1 operation.

## 2.2 Topic#2: Specification drafting general aspects

**Sub-topic#2-1**

**Issue 2-1-1: 36.102 UE spec drafting approach**

Moderator Proposal: Agree Option 1: For TS36.102, follow NR NTN approach, with same overall requirement framework and referencing 36.101 where requirements from 36.101 apply to 36.102 and are not band-specific. If not, then include requirement in new TS.

**Issue 2-1-3: UE spec structure**

A slight majority view to follow Option 1 (Suffix approach). Some support for a non-suffix approach.

Moderator Proposal: Suggest moving forward with Option 1 for now. As we become more familiar with the spec contents it should be very straightforward to adapt to a non-suffix approach if the opinion of the group changes. Do not include general and additional requirements in clause 4 text for these UE categories.

Agreement:

* For UE spec structure, follow suffix approach and do not include general and additional requirements in clause 4 text.

**Issue 2-1-4: TS36.102 skeleton approval**

Moderator Proposal: Modify the TS skeleton in R4-2211778 to:

* Add Scope
* Remove blue text from template.
* Remove square brackets from clauses.
* Allocate clause 4.3 as “reserved” in accordance with topic 2-1-3 outcome.
* Clause 5.4.2 – add editor’s note to indicate that this is pending raster decision.

**Sub-topic#2-2**

**Issue 2-2-1: SAN spec structure**

Moderator proposal: Agree option 1: Adopt TS38.108 structure as baseline approach for E-UTRA SAN spec independently of whether NB-IoT OTA requirements are included.

**Issue 2-2-2: Create a 37 series SAN spec to replace the already agreed 36 series SAN specification**

Moderator proposal: No consensus was reached, and further discussion needed. If a 37 series spec was adopted, the scope of work should be limited to single RAT E-UTRA requirements to align with current WI scope.

**Discussions:**

Huawei: the whole 36 series there are not OTA requirements. Those are only 1-C. For SAN, it does not make sense to have 1-C. We need 1-H or 1-O following the AAS architecture. If including SAN in 36 series, it would break the rule for the 36 series spec where no AAS is included. It is just spec number change and need Ran decision. 37 series is multi-RAT. 37 series include other shared spectrum not only MSR.

ZTE: Huawei comments are correct. 37 series is about the multi-RAT. If we use 37 series, it is wiered. We need check with MCC which series need be used. We do not have strong view.

Mediatek: the WI scope is written including 36 which is single RAT. There is no intention to specify the multi-standard. It will impact the schedule.

Huawei: To ZTE, you are right. 37 like AAS includes the single RAT. To Mediatek, it is not our intention to modify the scope and impact the timeline.

Thales: understand the concerns. Remind 38.108 includes 1-H and 1-O.

**Issue 2-2-3: 36.108 SAN skeleton approval**

Moderator proposal: Agree on the draft skeleton provided by TS rapporteur in [**R4-2213694**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213694.zip)

2.3 Topic#3: UE RF requirements

Moderator proposal: items in the table with a single option are proposed to be agreed. Items in red require further contribution or discussion. Items highlighted in yellow require specific attention in GTW.

|  |  |
| --- | --- |
| **Requirement clause** | **Moderator Proposal for each item (items highlighted suggested for specific attention in GTW)** |
| Clause 6: Transmitter Characteristics |  |
| 6.1: General | Agreement: Reuse TN (cat-M1 and NB1/2 relevant aspects) |
| 6.2.1: Tx power | Option 2: Power class 3 and 5 as defined for TN for **all** categories  Discussion:  Ligado: there are different requirements tolerance.  Agreement:   * Power class 3 and 5 as defined for **all** categories   + FFS on the tolerance |
| 6.2.2: MPR | Option 1: Depends on outcome of SEM/ACLR discussion |
| 6.2.3: A-MPR | Further discussion needed. Options for all categories were:  For b255   * Option 1: Depends on outcome of SEM/ACLR discussion and spurious emission for UE coexistence. * Option 2: Reuse n255 and n256 requirements from NR NTN * Option 3: Already clear that A-MPR is not needed.   Discussion:  Huawei: in NR NTN, there is no addition backoff allowed. Do we still need the additional requirement in the spectrum emission requirement? When we say we use NR NTN, the treatment of A-MPR for NR and LTE are different. For LTE the A-MPR is on top of MRP.  Ericsson: it depends on further discussion. We need also specify the sub-PRB A-MPR and we can discuss whether or not we should follow NR NTN. This is specific to Cat-M1 device, which was not discussed before. For NB-IOT the legacy has not A-MPR, for which it should be OK.  Qualcomm: before getting agreement, can we assume SEM and ACLR can be reused? Can we reuse the regulatory requirement? We should have some conclusion above two points. Regarding NB-IoT, no A-MPR is needed.  Ligado: Qualcomm is correct. There are different regulatory, which is captured in different NS values for TN and NTN. Agree with Ericsson, we are looking at 10, 20, rather than looking at 1.4MHz. We can go with no A-MPR for NB1 and NB2 and  Huawei: I wonder if there is any evaluation done for NB-IoT for band 24.  Ligado: the evaluation is done for different regulatory requirements. We cannot take the evaluation for TN. The evaluation is done for 5Mhz with NTN regulatory requirements where no backoff is needed.  Huawei: it is not clear for me that no A-MPR is needed for Cat NB1 and NB2 since the smaller bandwidth will be used.  For b256   * Option 1: Depends on outcome of SEM/ACLR discussion and spurious emission for UE coexistence. * Option 2: Reuse n255 and n256 requirements from NR NTN * Option 3: Already clear that A-MPR is not needed. |
| 6.2.4: Configured Tx power | Option 1: Reuse TN requirements for **all** categories  Agreement: Reuse TN requirements for **all** categories |
| 6.3: Output Power Dynamics |  |
| 6.3.1 Minimum output power | Option 1: Reuse TN requirements for **all** categories  Agreement: Reuse TN requirements for **all** categories |
| 6.3.2 OFF power | **All categories:** Option 1: Reuse TN requirements  Agreement: Reuse TN requirements for **all** categories |
| 6.3.3 Transmit ON/OFF mask | **Cat-M1:** Options for further discussion:  Option 1: Reuse TN requirements, and sTTI is applicable  Option 2: Reuse TN requirements, but sTTI not applicable  Discussion:  Ericsson: We just reuse the sTTI from legacy. We did not discuss whether or not sTTI should be applied to Cat M1. We do not need touch it, say, explicitly remove sTTI from IoT-NTN.  Agreement:   * Do not explicitly preclude sTTI from IoT-NTN. |
| **NB1/2:** Option 1: Reuse TN requirements  Agreement: Reuse TN requirements for **NB1/2** |
| 6.3.4 Power control | Option 1: Reuse TN requirements for **all** categories  Agreement: Reuse TN requirements for **all** categories |
| 6.4: Transmit signal quality |  |
| 6.4.1: Frequency error | Expected to use same requirement values for all categories, but NR NTN approach to frequency error needs to stabilize. Further contribution invited.  Agreement:   * Reuse 0.1 and 0.2 ppm requirements of frequency error and further discuss the condition where the requirements are applied. |
| 6.4.2: Transmit modulation quality | **Cat-M1:** Option 1: Reuse TN, but clarity on modulation orders needed.  Discussion:  Moderator: the modulation orders need be clarified. Is 64QAM supported for Cat M1? If we copy 36.101, basically we need copy all the modulation orders requirements.  **Further check the following bullet:**   * Follow the modulation orders supported by Cat M1 for TN in Rel-16 when specifying the requirements for IoT-NTN. |
| **NB1/2:** Option 1: Reuse TN (not beyond Rel-16 modulation schemes in line with WID)  Agreement: Reuse TN (not beyond Rel-16 modulation schemes in line with WID) for NB1/2 |
| 6.5: Output RF spectrum emissions |  |
| 6.5.1: Occupied bandwidth | **All categories:** Option 1: Reuse TN  Agreement: Reuse TN requirements for all categories |
| 6.5.2: Out of band emission |  |
| 6.5.2.1: SEM | **All categories:** Option 1: Assume TN as baseline, and reconfirm after coexistence verification |
| 6.5.2.2: Additional SEM | Option 1: For **all** categories and bands, this is not applicable.  Agreement: For **all** categories and bands, this is not applicable. |
| 6.5.2.3: ACLR | Option 1: For **all** categories, wait for coexistence verification outcome |
| 6.5.3: Spurious emission |  |
| 6.5.3.1: Minimum requirements | Option 1: Reuse TN for **all** categories  Agreement: Reuse TN requirements for **all** categories |
| 6.5.3.2: For UE co-existence | Option 1: Further contribution needed but consider NR NTN and existing E-UTRA TN as baselines. |
| 6.5.3.3 Additional spurious emissions |  |
| 6.6: Transmit intermodulation | **Cat-M1:** Further discuss between:   * Option 1: Requirement needs to be defined for 1.4MHz channel bandwidth * Option2: Not applicable for cat-M1   Discussion:  ZTE: Option 2 is also fine since there is no requirement before. Otherwise there would be mis-alignement between TN and NTN UE.  Ericsson: Same as ZTE.  Sony: Same comment.  Agreement:   * Agree Option 2. |
| **NB1/2:** Option 1: Reuse TN  Agreement: Reuse TN for **NB1/2** |
| 7.1: General | Option 1: Reuse TN  Agreement: Reuse TN requirements for all categories. |
| 7.2: Diversity characteristics | Option 1: Reuse aspects applicable for Cat-M1 and NB1/2 In TN  Agreement: Reuse aspects applicable for Cat-M1 and NB1/2 In TN |
| 7.3: Reference sensitivity | **Cat-M1 (1.4MHz):**  Different proposals discussed including reference to equivalent existing TN bands such as b24 and b65, to referring to a bandwidth-scaled version of n255 and n256.  More structured input needed here. |
| **NB1/2:** Option 1:Reuse TN (-108.2dBm for both bands)  Agreement: Reuse TN (-108.2dBm for both bands) for NB1/2 |
| 7.4: Maximum input level | Option 1: Same relative relaxation (15dB) as for NR NTN for **all** categories  Needs to be confirmed by further analysis. |
| 7.5: ACS | Option 1: Depends on outcome of coexistence verification for **all** categories |
| 7.6: Blocking characteristics |  |
| 7.6.1: In-band blocking | **All categories:** Option 1: Reuse TN  Agreement: Reuse TN for all the cateogries. |
| 7.6.2: Out-of-band blocking | **Cat-M1**:  For b255: Option 1: reuse TN (some ambiguity in the responses here)  Discussion:  Mediatek: Hardware of 24 can be applied for b255. It is feasible to reuse.  ZTE: Same understanding.  Agreement:   * For b255, agree Option 1.   For b256: Option 2: wait for NR NTN outcome in RAN4#104-e. |
| **NB1/2**:  For b255: Option 1: reuse TN (some ambiguity in the responses here)  Agreement:   * For b255, agree Option 1.   For b256: Option 2: wait for NR NTN outcome in RAN4#104-e. |
| 7.6.3: Narrow band | **Cat-M1:** Option 1: Reuse TN  Agreement: reuse TN requirements for Cat-M1. |
| **NB1/2:** Option 1: Not applicable (as for TN)  Agreement: Not applicable (as for TN) for NB1/2. |
| 7.7: Spurious response | **All categories:** Option 1: Reuse TN  Agreement: Reuse TN for all categories |
| 7.8: Intermodulation | **All categories:** Option 1: Reuse TN  Agreement: Reuse TN for all categories |
| 7.9: Spurious emissions | Option 1: Reuse TN for **all** categories  Agreement: Reuse TN for all categories. |

# References

[1] xxxxxxxxxxxxxxx